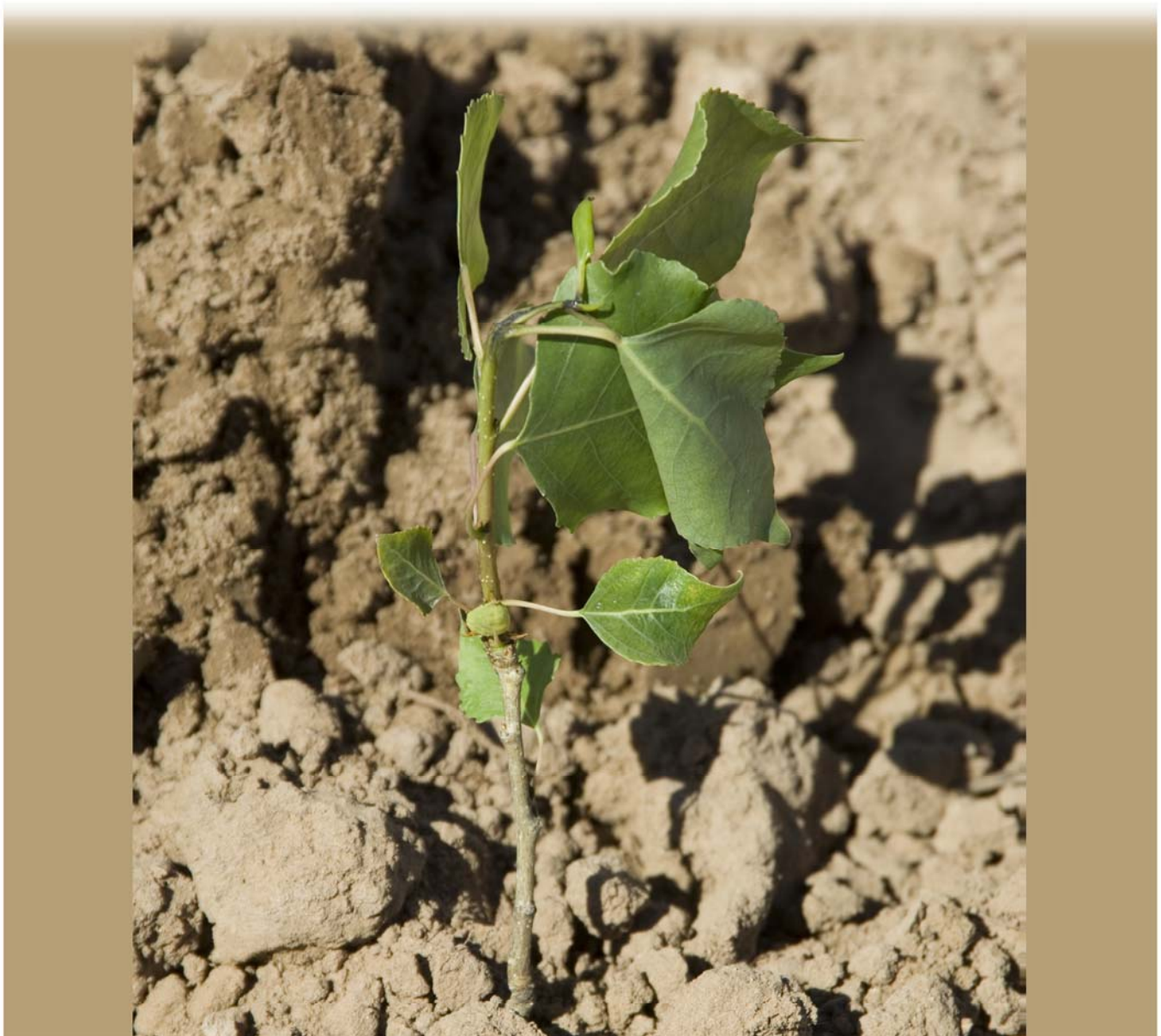




# Lower Colorado River Multi-Species Conservation Program

*Balancing Resource Use and Conservation*

## Cibola Valley Conservation Area Restoration Development Plan: Overview



July 2007

# **Lower Colorado River Multi-Species Conservation Program Steering Committee Members**

## **Federal Participant Group**

Bureau of Reclamation  
Fish and Wildlife Service  
National Park Service  
Bureau of Land Management  
Bureau of Indian Affairs  
Western Area Power Administration

## **Arizona Participant Group**

Arizona Department of Water Resources  
Arizona Electric Power Cooperative, Inc.  
Arizona Game and Fish Department  
Arizona Power Authority  
Central Arizona Water Conservation District  
Cibola Valley Irrigation and Drainage District  
City of Bullhead City  
City of Lake Havasu City  
City of Mesa  
City of Somerton  
City of Yuma  
Electrical District No. 3, Pinal County, Arizona  
Golden Shores Water Conservation District  
Mohave County Water Authority  
Mohave Valley Irrigation and Drainage District  
Mohave Water Conservation District  
North Gila Valley Irrigation and Drainage District  
Town of Fredonia  
Town of Thatcher  
Town of Wickenburg  
Salt River Project Agricultural Improvement and Power District  
Unit "B" Irrigation and Drainage District  
Wellton-Mohawk Irrigation and Drainage District  
Yuma County Water Users' Association  
Yuma Irrigation District  
Yuma Mesa Irrigation and Drainage District

## **Other Interested Parties Participant Group**

QuadState County Government Coalition  
Desert Wildlife Unlimited

## **California Participant Group**

California Department of Fish and Game  
City of Needles  
Coachella Valley Water District  
Colorado River Board of California  
Bard Water District  
Imperial Irrigation District  
Los Angeles Department of Water and Power  
Palo Verde Irrigation District  
San Diego County Water Authority  
Southern California Edison Company  
Southern California Public Power Authority  
The Metropolitan Water District of Southern California

## **Nevada Participant Group**

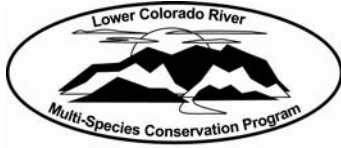
Colorado River Commission of Nevada  
Nevada Department of Wildlife  
Southern Nevada Water Authority  
Colorado River Commission Power Users  
Basic Water Company

## **Native American Participant Group**

Hualapai Tribe  
Colorado River Indian Tribes  
The Cocopah Indian Tribe

## **Conservation Participant Group**

Ducks Unlimited  
Lower Colorado River RC&D Area, Inc.



# **Lower Colorado River Multi-Species Conservation Program**

## **Cibola Valley Conservation Area Restoration Development Plan: Overview**

**Lower Colorado River  
Multi-Species Conservation Program Office  
Bureau of Reclamation  
Lower Colorado Region  
Boulder City, Nevada  
<http://www.lcrmscp.gov>**

**July 2007**

# Contents

<b>Acronyms and Abbreviations .....</b>	<b>vi</b>
<b>Background .....</b>	<b>2</b>
<b>1.0 Introduction.....</b>	<b>3</b>
Purpose.....	3
Location/Description.....	3
Land Ownership.....	4
Water.....	4
Agreements .....	4
<b>2.0 Restoration Development Plan .....</b>	<b>7</b>
Planting Design.....	7
Grading and Contouring .....	10
Planting Material/Planting Techniques.....	10
Herbicide/Fertilizer/Pesticide Application.....	11
<b>3.0 Management Overview.....</b>	<b>11</b>
Land Manager .....	11
Soil Management .....	11
Water Management.....	12
Irrigation System.....	12
Irrigation Practices .....	12
Structural Management.....	12
Woody Riparian Habitats.....	13
Law Enforcement.....	13
Public Use .....	13
Wildfire Management .....	13
<b>4.0 Monitoring.....</b>	<b>14</b>
Purpose.....	14
Monitoring Design.....	15
Resources .....	15
Predevelopment Monitoring .....	15
Implementation Monitoring.....	16
Habitat/Species Monitoring .....	18
Vegetation Classification.....	21
Monitoring Analysis and Evaluation .....	23
Reference Conditions.....	23
Thresholds.....	23
Trigger Points.....	24
Adaptive Management .....	24
<b>5.0 Reports.....</b>	<b>24</b>
Annual Report.....	24
Final Report .....	25
Literature Cited .....	26

## Figures

Figure 1. Location of Cibola Valley Conservation Area .....	5
Figure 2. Proposed Phasing Map .....	6
Figure 3. Typical Planting Plan .....	8
Figure 4. Flood Irrigation/Shallow Pools.....	9
Figure 5. Vegetation Classification.....	22

## Tables

Table 1. Water Entitlement and Priority .....	4
Table 2. Potential Native Plant Species List.....	10
Table 3. Tree Index of Condition.....	18
Table 4. Vegetation Communities, Criteria, and Types.....	21
Table 5. Reference Variables .....	23

# Acronyms and Abbreviations

<b>AGFD</b>	Arizona Game and Fish Department
<b>AMM</b>	Area Management Measures
<b>ARM</b>	Area Research Measures
<b>BACI</b>	Before-After-Control-Impact
<b>CVIDD</b>	Cibola Valley Irrigation and Drainage District
<b>CVCA</b>	Cibola Valley Conservation Area
<b>CW</b>	Cottonwood-willow land cover type, as defined in the LCR MSCP HCP
<b>HCP</b>	Habitat Conservation Plan
<b>HM</b>	Honey mesquite land cover type, as defined in the LCR MSCP HCP
<b>LCR</b>	Lower Colorado River
<b>LCR MSCP</b>	Lower Colorado River Multi-Species Conservation Program
<b>MCWA</b>	Mohave County Water Authority
<b>MMRP</b>	Mitigation Monitoring Reporting Program
<b>NWR</b>	National Wildlife Refuge
<b>Reclamation</b>	U.S. Bureau of Reclamation
<b>SWFL</b>	Southwestern Willow Flycatcher
<b>YBCU</b>	Yellow-billed Cuckoo

# Background

In 2002, the U.S. Bureau of Reclamation (Reclamation) prepared an initial assessment of the riparian restoration potential of the Cibola Valley Irrigation and Drainage District (CVIDD), a project study area of about 3,800 acres. The Mohave County Water Authority (MCWA) and the Hopi Tribe each purchased a portion of the Cibola Valley from CVIDD in December 2004. The Cibola Valley Conservation Area (CVCA), which is to be developed as part of the Lower Colorado River Multi-Species Conservation Program (LCR MSCP), will utilize the lands now owned by the MCWA.

Cibola Valley is an area of approximately 7,000 acres located in southwestern La Paz County, Arizona, about 15 miles south of Blythe, California. The valley encompasses the land inside an engineered bend of the lower Colorado River (LCR) and a remnant oxbow on the west side of the river (Palo Verde Oxbow). The valley is farmed primarily for cotton and alfalfa, and is bordered to the south by Cibola National Wildlife Refuge and on the east by unimproved land under the jurisdiction of the Bureau of Land Management.

In the valley, 1,019 acres of active agricultural lands owned by MCWA are currently available for restoration. This acreage comprises a number of parcels adjacent to the LCR in Township 1 North, Range 23 West within sections 19, 20, and 21, and Township 1 North, Range 24 West within sections 24, 25, and 36, La Paz County, Arizona.

For large habitat restoration sites that are developed over a number of years such as CVCA, the restoration activities are typically divided into phases. This document, *Cibola Valley Conservation Area Restoration Development Plan: Overview*, provides an overview of the restoration potential of the site as well as the projected phasing of development. To document the development of habitat on the property, each fiscal year a phase-specific restoration plan will be prepared that documents the planning, design, planting, and monitoring requirements of that phase.

An annual report will be prepared and made available, typically in April of each calendar year, summarizing restoration and monitoring activities conducted during the previous year. Specific information on the contents of the annual report can be found in Section 5 of this document.

Through the adaptive management process, a Restoration Plan for each Phase will be prepared. This plan will incorporate the monitoring results from the previous year. The plan will include the planting design, planting techniques grading plan, and demonstration or research plan for the acreage that will be converted. The monitoring results will be used to determine the amount of structural management that will be accomplished in the next year and any modifications to previously restored habitats.

# 1.0 Introduction

The LCR MSCP is a multi-stakeholder Federal and non-Federal partnership responding to the need to balance the use of lower Colorado River (LCR) water resources and the conservation of native species and their habitats in compliance with the Endangered Species Act. This is a long-term (50 year) plan to conserve at least 26 species along the LCR from Lake Mead to the Southerly International Boundary with Mexico through the implementation of a Habitat Conservation Plan (HCP). Most of the covered species are State and/or Federally listed special status species. Reclamation is the entity responsible for implementing the LCR MSCP over the 50-year term of the program. A Steering Committee currently consisting of 54 entities has been formed, as described in the *LCR MSCP Funding and Management Agreement*, to provide input and oversight functions in support of LCR MSCP implementation.

The overall goal for the CVCA is to develop a variety of land cover types and maintain habitat that will contribute to the habitat objectives for covered species outlined in the LCR MSCP HCP.

## Purpose

This document serves as the initial guide for the creation and maintenance of habitat, a process that will continue to evolve through an Adaptive Management Program described in this plan. Subsequent documents will provide detailed information for each proposed phase and identify the annual development of land cover types on the property.

The intent is to create as much riparian habitat as possible under the HCP, which will be managed for the southwestern willow flycatcher (*Empidonax traillii extimus*) (SWFL), yellow-billed cuckoo (*Coccyzus americanus occidentalis*) (YBCU), and other species covered under the LCR MSCP HCP. The creation of habitat includes both the establishment of native plants and the management of the vegetation and its structural type to meet performance standards for integrating seral stages of vegetation, moist soil, standing water, and open areas into mosaics of riparian vegetation.

This plan provides management options for habitats for covered species in Reach 4, which extends from Parker Dam (RM 192.3) to Reclamation's Cibola Gage (RM 87.3), and is described in more detail in the LCR MCSP HCP habitat objectives. The plan provides habitat restoration design and management methods, including construction (planning and design), monitoring, research, and reporting incorporated within an adaptive management plan. Data from monitoring and research results will be integrated into the plan to provide for future successful habitat restoration and objectives.

## Location/Description

The 1,309-acre CVCA is located in Arizona between River Miles 98.8 and 104.9 (see Figure 1). The initial partnership for CVCA includes Reclamation, Mohave County Water Authority (MCWA), and Arizona Game and Fish Department (AGFD).

The legal description of this area is Gila and Salt River Base and Meridian, La Paz County, Arizona; Township 1 North, Range 23 West, Section 20, S1/2 SE1/4, W1/2 NW1/4 SE1/4, NE1/4 SE1/4 (within). The Assessor Parcel Numbers are 302-03-005, 302-03-002C, and 302-03-002D. The land and water will be leased from MCWA.

## Land Ownership

The property is owned by MCWA who will, in the short-term, be leasing acreage to Reclamation to develop native land cover types. The proposed development schedule for Phases 1, 2, and 3 as well as the location of remaining acreage to be developed is shown in Figure 2. It is anticipated that the property will be owned and managed by a non-Federal partner.

## Water

For the long-term, 2,919 acre-feet per year diversionary right of 4<sup>th</sup> Priority Colorado River water will be available for irrigation use. Reclamation has an option to purchase 1,300 acre-feet per year from the MCWA's entitlement and 1,500 acre-feet per year from the Hopi Tribe's entitlement. In addition, Reclamation has a 4<sup>th</sup> Priority entitlement for 118.94 acre-feet per year (Table 1).

Currently, 7,747 acre-feet per year diversionary right of combined 4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> Priority Colorado River water is available for lease from MCWA to the LCR MSCP to accommodate the higher water diversions required to establish habitat (Table 1).

**Table 1. Water Entitlement and Priority**

Term	Entitlement	Priority
<b>Long-Term</b>		
Purchase option from MCWA entitlement	1,300 acre-feet/year	4th
Purchase option from Hopi Tribe entitlement	1,500 acre-feet/year	4th
Reclamation entitlement	119 acre-feet/year	4th
<b>Long-Term Total</b>	2,919 acre-feet/year	
<b>Short-Term</b>		
Multi-year lease from MCWA entitlement	5,997 acre-feet/year	4th
Multi-year lease from MCWA entitlement	750 acre-feet/year	5th
Multi-year lease from MCWA entitlement	1,000 acre-feet/year	6th
<b>Short-Term Total</b>	7,747 acre-feet/year	

## Agreements

A Restoration Agreement will be drafted that assures the availability of land and water resources for the 50-year term of the program.

**Figure 1. Location of Cibola Valley Conservation Area**

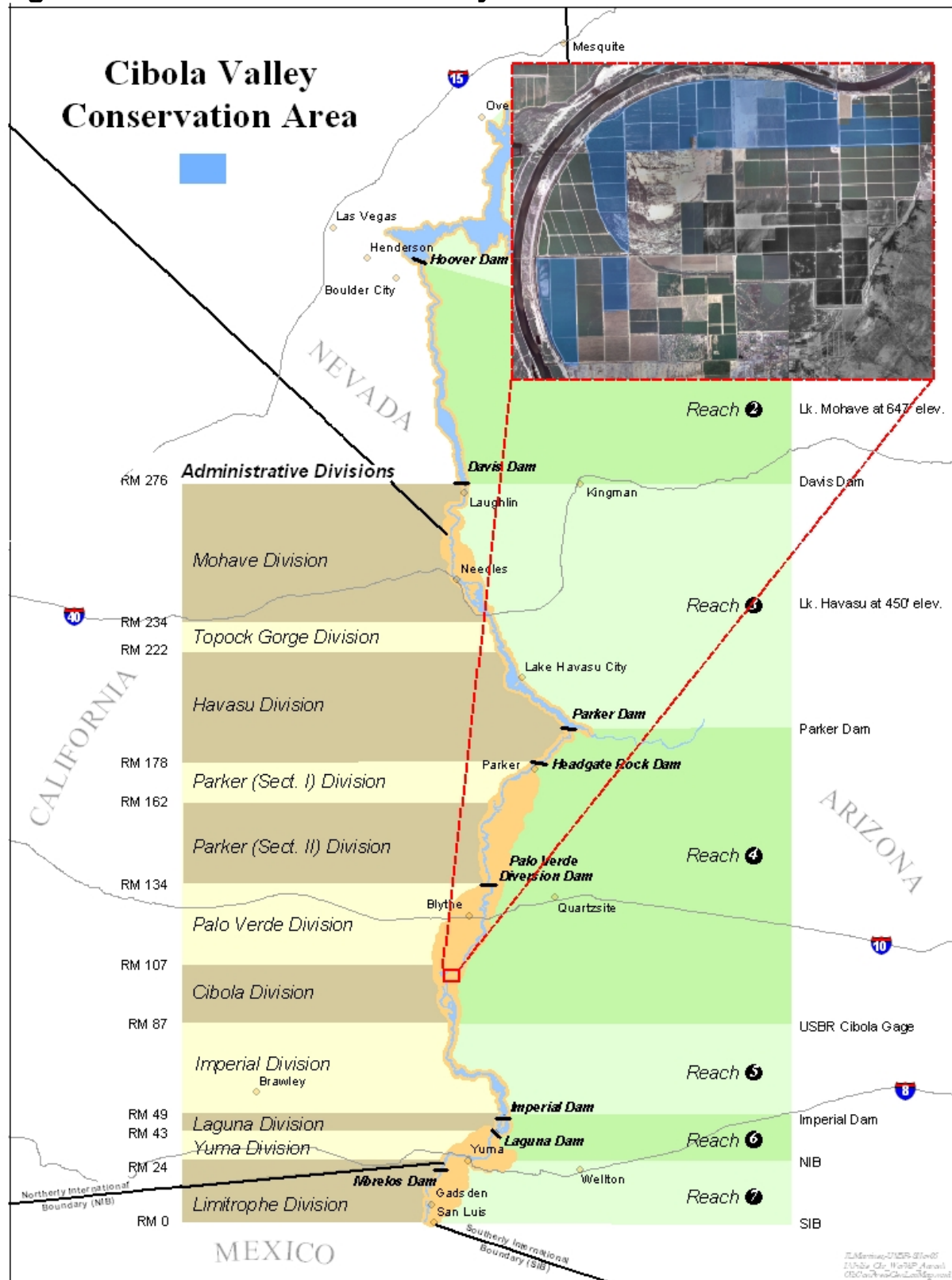
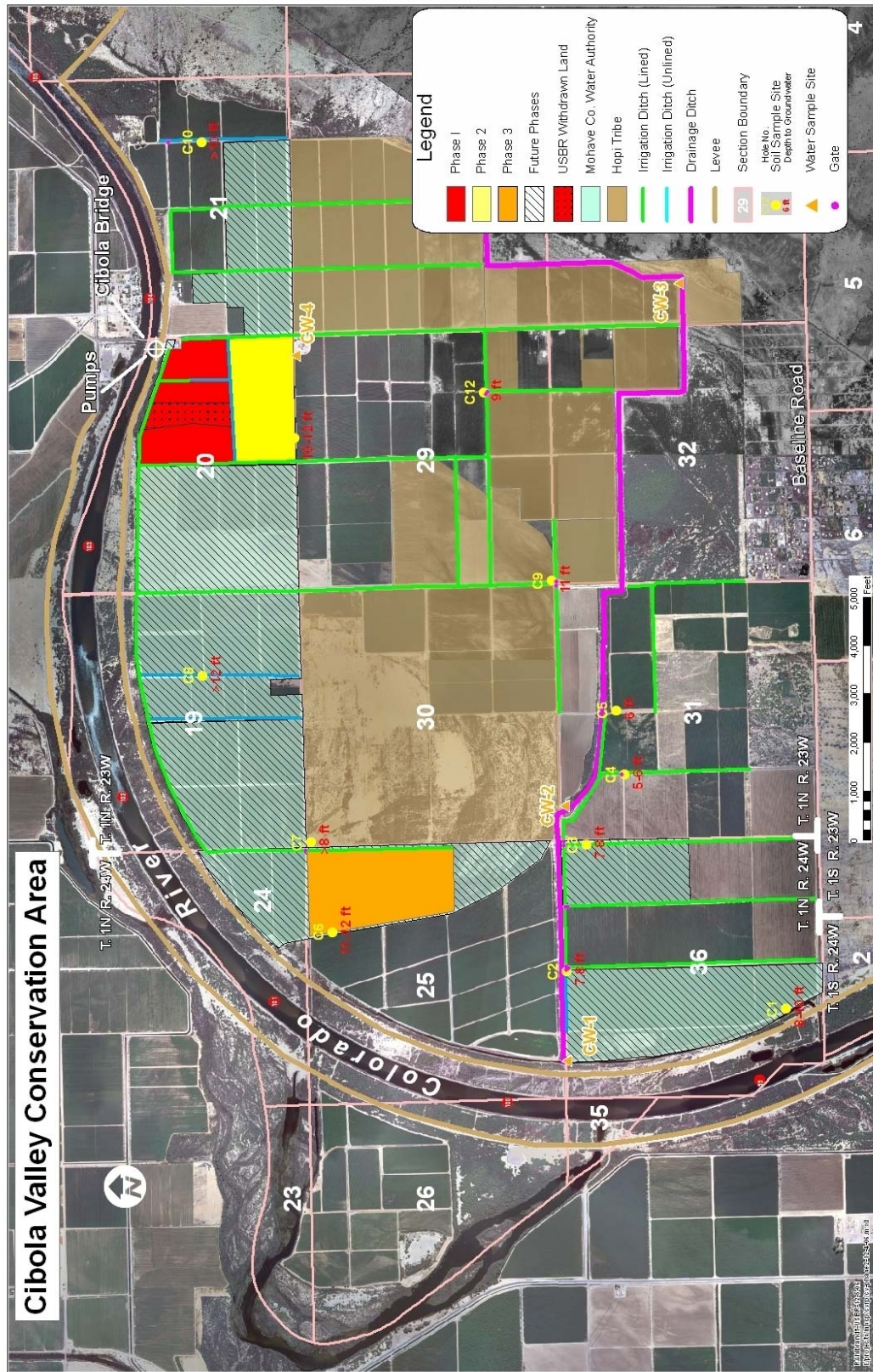


Figure 2. Proposed Phasing Map



## 2.0 Restoration Development Plan

The intent of the restoration plan is in part to outline the steps necessary to create, develop, and maintain riparian habitat conditions for 1,566 acres of cottonwood-willow seral stages I-IV and 5,940 acres of cottonwood-willow seral stages I-IV, as outlined in the LCR MSCP HCP.

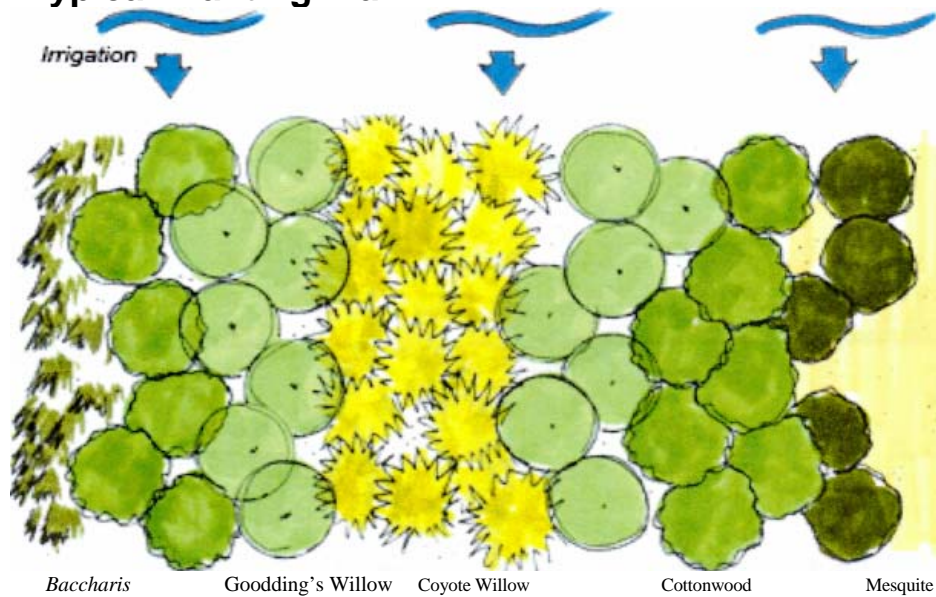
The area will be managed for SWFL, YBCU, and other LCR MSCP covered species. The plan generally will be used as a guide to create and manage 50% of cottonwood-willow in seral stage I. The other 50% will be created and managed for seral stages III and IV. The area will be designed and planted to create the known preferred conditions necessary for the listed species, to include areas of contouring for moist soil and standing water, and mosaics of vegetation. As more specific information regarding habitat conditions for the covered species become known, the information will be incorporated into future phase-specific development plans.

### Planting Design

The planting design incorporates native riparian species along the LCR into a mosaic of created habitats. Areas of cottonwood-willow and honey mesquite cover types are based on information in the LCR MSCP HCP for each species. Patch size of created habitats are designed and managed to provide habitat for more than one species. Based on site conditions, cottonwood-willow and honey mesquite will be created in proximity to each other to re-create an integrated mosaic of habitats that approximates terrestrial communities that were historically present in the floodplain. When feasible, areas of standing water or moist soil, and open areas (areas with ground cover and low shrubs) will be incorporated into the design. Reclamation anticipates high plant diversity for habitats created at CVCA based on an integrated mosaic approach for planting. By employing this approach, a higher quality habitat is anticipated.

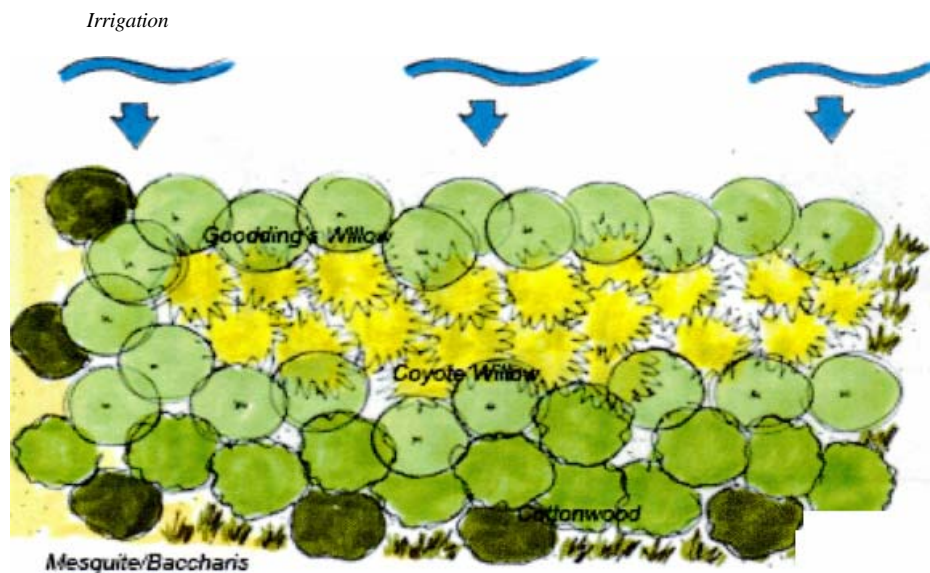
The planting design establishes vegetation species with higher water needs closer to irrigation gates, and the species that require less water further from the irrigation gates (Figure 3). The design utilizes the slope of the field for irrigation purposes. Canals, depressions, and ponds will be designed so that the flow of water will start at the gate end and continue to the opposite side of fields (Figure 4). These areas will be irrigated more frequently from April through September (breeding season of the SWFL) so that multiple areas will have moist soils or standing water.

**Figure 3. Typical Planting Plan**



**Plan #1**

This mosaic of habitat includes the following elements: drought-tolerant vegetation, riparian vegetation, and moist/saturated soils. The design takes into consideration observed natural riparian vegetation configuration, with drought-tolerant vegetation on the edges progressing to riparian in the middle. The design creates a buffer zone around the Goodding's willow-coyote willow area, which is potential habitat for the southwestern willow flycatcher. Water is delivered through gates to each species according to the water requirements for the species.



**Plan #2**

All the same elements are included as in Plan #1, but arranged in a different configuration. Coyote willow-Goodding's willow relationship remains the same in this planting plan. Water is controlled for moist/saturated soils and the required needs of the willows. Vegetation is planted according to water requirements of each species. Vegetation species with the highest water requirements are located closest to the irrigation gate (willows), followed by cottonwood and an edge of mesquite.

**Figure 4. Flood Irrigation/Shallow Pools**



*Shallow pools, lined or formed with soil amendments are set in the soil with top at grade. These pools areas will create places where water collects, during a normal irrigation cycle. Water flows across field filling the pool areas and continues across the field. Water will evaporate from pools, but will be refreshed each time the field is irrigated. As time goes on the pools will fill with soil and debris, but still have the ability to hold water or moist soils.*

*Riparian vegetations with standing water*



*As trees and ground covers increase in density and height, evaporation rates decrease due to soil conditioning from organic debris. Pools will hold water longer. Vegetative species that prefer moist or wet soil will begin to grow around the pool areas, and conditions needed by the covered species will eventually develop.*

The following table lists the potential species that may be used in the development of habitat at CVCA (Table 2). Each phase plan will include the specific plant species and estimated quantities that will be planted.

**Table 2. Potential Native Plant Species List**

<b>Scientific Name</b>	<b>Common Name</b>
<i>Populus fremontii</i>	Fremont Cottonwood
<i>Salix gooddingii</i>	Goodding's Willow
<i>Salix exigua</i>	Coyote Willow
<i>Prosopis glandulosa</i> var. <i>torreyana</i>	Honey Mesquite
<i>Atriplex lentiformis</i>	Quailbush
<i>Atriplex canescens</i>	Four-wing Saltbush
<i>Atriplex polycarpa</i>	Cattle Saltbush
<i>Baccharis sarothroides</i>	Desertbroom
<i>Baccharis salicifolia</i>	Mule's Fat
<i>Distichlis spicata</i>	Inland Saltgrass
<i>Encelia farinosa</i>	Brittlebush

## Grading and Contouring

Initial ground preparation includes laser leveling of the existing fields to ensure complete and even coverage of irrigation water and to utilize the water in a cost-efficient manner. Generally, berms or borders are used to control irrigation to areas requiring more water and deliver water efficiently. To the extent necessary, these borders may also be used for water collection areas to create moist soils. Contouring may be used on the site to create wet swales or ponding areas; however, a specific grading design will be included with each phase plan for approval prior to implementation. Over time, such factors as wind erosion, water erosion, and buildup of debris will likely cause changes in topography that mimic a natural grading change. As necessary, the specific grading and contouring plans will be included in each individual phase plan prior to implementation.

## Planting Material/Planting Techniques

Plant material for the project will be collected from the CVCA nursery, other established LCR MSCP nurseries along the LCR, and areas that are ecologically similar. Planting techniques that have been proven successful to date include the following:

- Automated mass transplanting
- Dormant pole cutting/planting
- Hydro seeding
- Planting poles, potted plants, or slips with a conventional tree planter
- Seeding
- Perimeter planting of poles, potted plants, or slips

Planting techniques may include a combination of these or any other planting techniques that have been researched or demonstrated to be successful and cost effective. The specific planting technique will be included in each individual phase plan prior to implementation.

## **Herbicide/Fertilizer/Pesticide Application**

To maintain healthy stands of native riparian species, the application of herbicides, fertilizer, and pesticides may be required. All herbicide, fertilizer, or pesticide applications will be applied by persons possessing valid applicator's licenses for the chemicals being applied and in compliance with the rules, regulations, and laws set by the State of Arizona and La Paz County.

All records and associated chemical application documents will be stored by the land manager and will include:

- Training records of all employees handling pesticides and herbicides
- Material Safety Data Sheets for all pesticides, herbicides, and fertilizers
- Location map of herbicide and pesticide storage site
- Use of Arizona and La Paz County approved herbicide, pesticide, and fertilizers
- Record of herbicide, pesticide, or fertilizer use

## **3.0 Management Overview**

### **Land Manager**

Reclamation will be responsible for ensuring the long-term operation and maintenance of CVCA throughout the 50-year term of the LCR MSCP. The details of operations and maintenance of CVCA will be agreed upon between Reclamation, MCWA, and AGFD; and will include species monitoring, soil, water, vegetation structure, law enforcement, public use, wildfire management, research, and monitoring. Each specific area will be addressed in the adaptive management plan.

### **Soil Management**

Because CVCA is located within the Colorado River Floodplain, sands and silts were deposited over time by numerous flood events. Several soil series and associations are found on the property, primarily Indio silt loam and Lagunita silt loam. Sand and sandy loam soils have a low water retention capacity and drain easily. Because some riparian habitats have areas of standing water or moist soils, soil management will include efforts to increase water holding capacity where appropriate. Adding organic material to soil will likely increase water holding capacity and add nutrients to the soil for plant growth. Planting cover crops can decrease wind erosion and help protect topsoil.

The following is a list of methods that may be used to manage soil water holding capacity and nutrients, and to prevent salinity build-up:

- Leaves, vegetative debris, and branches left on site to decay.
- Demonstration techniques including the use of various mulches such as wood chips and straw
- Planting a ground cover
- Appropriate irrigation schedules to flush salts from the soil
- Fertilizer

Soil management may include combination of these or any other techniques that have been researched or demonstrated to be successful and cost effective.

## **Water Management**

### **Irrigation System**

The primary water management at CVCA will be an efficient irrigation system and irrigation schedule. Currently, CVCA has an irrigation system that comprises lined and unlined delivery ditches and associated slide gates. Four electric pumps deliver water to the irrigation system from the Colorado River.

A local farmer has been contracted to provide irrigation services and to inspect ditches, canals, and gates, and report the results to Reclamation. Additional visual inspections will be performed by this person each time the fields are irrigated.

### **Irrigation Practices**

It is anticipated that all the CW land cover will be flood-irrigated on a regular basis. Irrigation will be increased during breeding and nesting season of the SWFL to create moist soil conditions. Small areas will be created to hold irrigation water during SWFL season (April through August). Moist soils and areas of standing water encourage insect diversity and can also increase the relative humidity localized within the vegetation canopy, which has been observed as a component of habitat for SWFL. These conditions may be accomplished using liners, concrete, soil amendments, or any methods that will accomplish the goal of creating areas of standing water or moist soils.

Irrigation management may include a combination of these techniques or any other techniques that have been researched or demonstrated to be successful and cost effective. The specific irrigation schedule will be included in the individual restoration phase plans prior to implementation. This schedule may be modified as needed.

## **Structural Management**

Selective harvesting within the CW habitat will be used to create the targeted structurally diverse habitat. Reclamation defines “harvesting” as the collection of cuttings or poles when the trees are dormant. The intent is to mimic the seral stages preferred by the SWFL.

## **Woody Riparian Habitats**

Created habitats will be managed to support CW types I, III, and IV for SWFL and CW types I and III for YBCU. The following methods for structural management will be implemented to achieve the desired cover type classifications. The structural types are based on Anderson and Ohmart (1984) proportional distribution of the vegetation. The CVCA property will be assessed annually at the end of each growing season to identify structural types. The following methods may be modified and new methods may be added depending on research and demonstration of techniques, through the adaptive management plan:

- Planting appropriate riparian vegetation that matures to recommended heights
- Manually maintaining three distinct heights or layers of vegetation
- Designing planting plan so that canopy trees do not shade out middle and bottom foliage
- Selectively removing intermediate vegetation
- Creating open areas with shrubs and grasses that are integrated with areas of foliage

Structural management may include a combination of the above or any techniques that have been researched or demonstrated to be successful and cost effective.

## **Law Enforcement**

Specific law enforcement arrangements will be developed once long-term land ownership is finalized.

## **Public Use**

Public use and other activities will be coordinated with MCWA or any future land owners or managers and other stakeholders to ensure that they are consistent with and do not adversely affect restoration activities at CVCA.

## **Wildfire Management**

As guided by commitments in the HCP, wildfire management practices on CVCA will:

- Reduce the risk of the loss of created habitat to wildfire by providing resources to suppress wildfires, such as contributing to and integrating with local, State, and Federal agency fire management plans
- Implement land management and habitat creation measures to support the reestablishment of native vegetation that is lost to wildfire

Wildfire management may include the rapid response of irrigating the affected field and the fields immediately adjacent to the wildfire within CVCA.

## 4.0 Monitoring

This section contains the overall strategy for monitoring the CVCA restoration project. Subsequent documents (Restoration Phase Plans) provide the specific monitoring requirements for each phase and will typically be created on an annual basis.

Monitoring is critical to the Adaptive Management Program. This process allows the LCR MSCP to analyze implementation activities, address the uncertainty inherent in a 50-year program, and respond appropriately. Scientifically designed monitoring studies will be conducted to evaluate whether the restoration parameters established for each covered species habitat are being achieved, the restoration area develops as covered species habitat, and the habitat is being utilized by the covered species. Results on how the created habitat develops, relative to the restoration and management techniques employed, will be used to refine techniques and develop the most cost-effective and efficient approaches for future phases at CVCA and other restoration sites.

Initial conservation area monitoring plans are based on elements described in the HCP (LCR MSCP 2004). The science and adaptive management plan strategies for the LCR MSCP are found in the *LCR MSCP Draft Final Science Strategy* (Bureau of Reclamation 2006). The monitoring plan elements for CVCA may be revised after those strategies have been adopted.

Monitoring at CVCA will be structured into four categories:

- Predevelopment monitoring
- Implementation monitoring
- Habitat/Species monitoring
- Vegetation classification

The goals for monitoring may be revised depending on the Adaptive Management Program results, covered species requirements, or other management decisions in the future. All monitoring will be designed specifically for each phase and habitat type within that phase. Covered species monitoring will be organized into the following guilds: marsh birds, neotropical birds, cavity nesting birds, small mammals, bats, and reptiles and amphibians. The SWFL, YBCU, and MacNeill's sootywing skipper will be monitored using species-specific protocols.

### Purpose

The purpose of the CVCA monitoring plan is to determine whether restoration parameters established for each covered species habitat are being achieved, when each phase of CVCA develops as covered species habitat, and if the habitat is being utilized by the covered species. The Avoidance and Minimization Measures, Conservation Area Management Measures (AMM), Monitoring and Research Measures (MRM), and General and Species-Specific Conservation Measures from the LCR MSCP HCP document dictate the range of data collected, analyzed, and incorporated into the adaptive management plan.

## Monitoring Design

Sampling design is based on a quasi-experimental design using the Before-After Control-Impact (BACI) design (Stewart-Oaten and Osenberg 1992, Bernstein and Zalenski 1983, Green 1979). The BACI approach prescribes the collection of data prior to an activity and comparison to data collected after the activity (Smith 2002). The quasi-experimental design will use pre-restoration phases as controls. The designs will utilize randomization where possible. Subsamples of each phase will be taken at the same or similar randomized points both pre- and post-restoration. To the greatest extent practicable, pre-restoration monitoring will be conducted for a minimum of 1 year prior to the implementation of each phase.

## Resources

Population and habitat resources are determined based on the appropriate AMM, MRM, and General and Species-Specific Conservation Measures, and monitoring will be conducted both pre- and post-restoration. Select resources will only be monitored post-restoration if no potential exists prior to development for the existing agricultural fields to support populations of targeted covered species (e.g., SWFL has never been found to occupy cotton fields). In most cases, the resources monitoring will focus on guilds of species for efficiency. The pre- and post-restoration resources that will be monitored are summarized below in each appropriate monitoring category. Specific protocols that have been developed for each resource may be found in the document entitled *Draft 2006 Monitoring Protocols for the LCR MSCP*.

## Predevelopment Monitoring

Predevelopment monitoring is designed to establish what types of restoration activities may be conducted, establish baseline data for evaluating post development, and identify whether covered species currently inhabit CVCA. To establish baseline conditions, an understanding of the current and historical conditions at CVCA is necessary.

Predevelopment monitoring is divided into abiotic (soil features) and biotic (vegetation and covered species) factors:

- Abiotic Monitoring
  - Soils
    - Samples are taken from each phase after removal of the agricultural crop and before the planting of the trees.
    - Samples in each phase are analyzed for moisture, salinity, textural classification, depth to ground water, and nutrients, including nitrate, ortho-phosphate, and ammonia.
  - Microclimate
    - If any covered species are found during pre-restoration surveys, microclimate monitoring will be conducted to measure temperature and relative humidity, and data will be compared with post-restoration data.
- Biotic Monitoring

- Vegetation Monitoring  
Currently, CVCA consists entirely of farm fields, and no riparian or marsh habitat is present; therefore, only *Atriplex* spp. will be surveyed and mapped.
- Avian Monitoring:
  - Neotropical birds will be monitored utilizing a standardized point-count protocol (GBBO 2003). Because CVCA is currently in homogeneous agricultural crops, only three point-count transects will be established along the existing roads.
  - Marshbirds will not be monitored, as marsh habitat is not present.
  - Cavity nesting birds will not be monitored, as riparian or mesquite habitat is not present. However, point-count surveys will record any avian species present during the predevelopment monitoring phase.
  - Species-specific SWFL and YBCU surveys will not be conducted, as riparian habitat is not present. However, point-count surveys will record any avian species present during the predevelopment monitoring phase.
- Small mammal presence/absence surveys will be conducted utilizing a standardized protocol. Trapping will occur prior to the implementation of each phase between late September-November and late February-May. Trapping will be conducted overnight. Trapping will be conducted for a minimum of 500 trap nights.
- Bat presence/absence surveys will be conducted utilizing active/passive AnaBat surveys at least two days per season (spring, summer, winter, and fall), prior to the implementation of each phase. All AnaBat system locations will be chosen based on suitable habitat for the covered bat species and ability to maximize data collected.
- Amphibian and reptile monitoring will not be conducted because CVCA is outside of the known range of the covered amphibian species and does not currently meet covered reptile species habitat requirements.
- MacNeill's sootywing skipper presence/absence surveys will be conducted if *Atriplex* spp. is located at CVCA. Visual surveys will be conducted when the skipper flies between April and October (Pollard 1977). A minimum of three surveys will be conducted.

## Implementation Monitoring

Implementation monitoring will be conducted to assess whether land cover type creation and management actions have been implemented as designed for each phase. This type of monitoring quantifies changes immediately after treatments and evaluates whether actions were implemented as prescribed (Block et al. 2001). For example, this type of monitoring would be used to determine that the planting techniques employed were effective and vegetation was planted according to the phase design specifications. This monitoring is focused on the habitat (biotic) and conditions therein (abiotic):

- Abiotic Monitoring
  - Soil

- Samples in each phase will be analyzed for moisture, salinity, textural classification, depth to ground water, and nutrients, including nitrate, ortho-phosphate, and ammonia.
    - Samples will be collected annually until the nutrient and salinity measurements are stable.
  - Water
    - Deliveries will be recorded.
- Biotic Monitoring
  - Vegetation
    - Four to six weeks after planting (or after dormancy break), a sample of the trees will be counted and an index of condition (Table 3) will be recorded to determine initial survivorship. These data will be used to guide initial management activities, such as water use and re-planting.
    - After the first two growing seasons, growth and survivorship will be determined, utilizing transects through each phase during the dormancy period (October-January). Sample transects would be randomly determined on an annual basis. The number of sample transects would be determined for each phase and will be based on several factors including patch size, restoration technique, vegetation species, and variation within each stand. Within each sample transect, every tree will be counted and recorded by species. Diameter at breast-height and tree condition (Table 2) will be recorded for every hundredth tree sampled. Percent cover will be measured at random 1-meter square plots in each transect to evaluate herbaceous and shrub plant component.

**Table 3. Tree Index of Condition**

<b>Condition</b>	<b>Definition</b>
<b>Live</b>	Trees appear in apparently good condition; leaves green, no symptoms of wilting, die-back, or chlorotic appearance of leaves.
<b>Stressed</b>	Trees appear to be in generally poor condition; chlorotic leaves and leaf drop.
<b>Tip die-back</b>	The main stem is in good condition; the most apical portions are in very poor condition exhibiting wilting and die-back symptoms.
<b>Basal sprouts</b>	Main stem dead; new growth is initiated from stem base or root stock.
<b>Not found</b>	Seedling not found during particular sampling period. If seedling not found in two consecutive periods, it is considered dead.
<b>Apparently dead</b>	General appearance of stem is dry and brittle; no live wood observed and no observable green foliage growth; re-sprouting still possible.
<b>Dead</b>	Previously listed as apparently dead; tree in such poor condition that survival by re-sprouting is unlikely.

## Habitat/Species Monitoring

Habitat/species monitoring is designed to determine whether each Phase 1 is providing the habitat requirements needed for the targeted covered species, if any covered species is utilizing the habitat, and if there are differences in wildlife use of the habitat depending on planting design, composition, and watering regimes. All monitoring will be designed specifically for each phase and habitat type within that phase. The monitoring is divided into habitat and covered species and will be analyzed incorporating both categories:

- Habitat Monitoring
  - Abiotic Conditions
    - Soil
      - Samples will continue to be analyzed for moisture, salinity, textural classification, depth to ground water, and nutrients (including nitrate, ortho-phosphate, and ammonia) until the conditions are stable. When conditions reach the reference points, samples will be analyzed every 3 to 5 years. If conditions change, samples will be analyzed annually until conditions reach the reference point again.
      - Soil moisture probes will be utilized 10 times during the breeding season for SWFL, in SWFL habitat, beginning the year SWFL surveys are conducted.
      - Samples will be conducted minimally at the same site as the predevelopment monitoring.
    - Water

- Deliveries to each phase will be recorded and analyzed to determine if the necessary amounts were delivered to grow the requisite habitat.
- Microclimate
  - Random and strategically located data loggers will be placed within the habitat. Data loggers record temperature and relative humidity. The number of data loggers for each phase will be based on acreage of restored habitat. Data loggers will be downloaded approximately every 4 months. If a SWFL or YBCU nest is located, a data logger will be placed within 2 meters of the nest.
- Biotic Conditions
  - Vegetation
    - Beginning at the end of the third growing season, habitat condition will be monitored using a standardized protocol based on a nested sample plot design. Initially, habitat monitoring will occur on an annual basis (years 3 through 6). Monitoring will occur every other year between year 6 and year 10. After year 10, each site will be sampled every 5 years to monitor successional change through the LCR MSCP term. If a catastrophic disturbance (fire, flood, etc.) occurs to the stand, post-disturbance monitoring will mimic the post-restoration monitoring regime.
    - Vegetation monitored will include: overstory trees, sapling, shrub, understory, herbaceous layer, vertical foliage density, and crown closure.
- Covered Species Monitoring
  - Marshbirds
    - Monitoring will not be conducted because no marshbird habitat will be restored.
  - Neotropical Birds
    - A standardized point-count protocol (GBBO 2003) will be used. Point counts will be conducted annually during the breeding season (May-July) once each month beginning the first May, after the planting of each phase. Separate transects for each phase will be conducted based on habitat type and acreage.
    - Standardized breeding and winter season banding/mistnetting (DeSante 2005) may be conducted if conditions warrant.
    - Standardized area searches (Ambrose 1989) may be conducted if conditions warrant (areas less than 20 acres).
    - If covered species are observed, targeted species-specific surveys, nest searches, and banding/mistnetting may be conducted.
  - Cavity Nesting Birds
    - Elf owl surveys may be conducted after 4 to 6 years, depending on when the land cover type structure and density indicate the habitat has achieved the reference conditions. Installed nest boxes will be monitored during the breeding season (April-July) for elf owls. If an elf owl is detected during

- the breeding season, nest searches or targeted banding/mistnetting may be conducted for long-term use of site and refinement of habitat use.
- Gilded flickers and Gila woodpeckers will be surveyed as part of the neotropical bird monitoring mentioned above. Installed snags will be monitored during the breeding season (May-July). If gilded flickers or Gila woodpeckers are detected during the breeding season, nest searches or targeted banding/mistnetting may be conducted for long-term use of site and refinement of habitat use.
  - Southwestern Willow Flycatcher
    - Standardized presence/absence surveys (Sogge et al. 1997, USFWS 2000) will be conducted after three growing seasons, depending on when the land cover type structure and density indicate the habitat has achieved the reference conditions. A minimum of five surveys will be conducted beginning in May and ending in July. If an SWFL is detected after June 15 or positive breeding evidence is identified, nest searches will be conducted to determine breeding status and use of habitat. Targeted banding/mistnetting may be conducted for long-term use of site and refinement of habitat use.
  - Yellow-billed Cuckoo
    - Standardized presence/absence surveys (Halterman and Johnson 2005 Draft) will be conducted after three growing seasons, depending on when the land cover type structure and density indicate the habitat has achieved the reference conditions. A minimum of five surveys will be conducted beginning in June and ending in September. If a YBCU is detected during the breeding season, nest searches will be conducted and targeted banding/mistnetting may be conducted for long-term use of site and refinement of habitat use.
  - Small Mammals
    - Standardized presence/absence surveys will be conducted at least once annually between September-November and late February-May. Trapping will be conducted overnight. Traps will be placed in parallel, linear transects of approximately 150 meters in length. A trap station will be located at 10-meter intervals along each transect. Transects will be located 10 to 15 meters apart, with the actual distance apart determined by the size of the area being surveyed. Trapping will be conducted for a minimum of 500 trap nights.
  - Bats
    - Presence/absence surveys will be conducted utilizing active/passive AnaBat surveys at least 2 days per season (spring, summer, winter, and fall) annually. When the vegetation is at sufficient height to hide the equipment, data may be collected daily utilizing two stationary AnaBat/Sonabat systems. One system will be installed in a riparian phase and one system in a riparian/mesquite phase to be determined later. The stationary systems will be established for at least 5 years. Data will be examined after the 5-year period, and future monitoring decisions for bat species will be made. All system locations will be chosen based on

suitable habitat for the covered bat species and ability to maximize data collected.

- Reptiles and Amphibians
  - No monitoring will be conducted because no habitat for reptiles and amphibians will be restored or removed.
- MacNeill's Sootywing Skipper
  - Pollard Walks (Pollard 1977) visual surveys will be conducted in the *Atriplex* spp. habitat when the skipper flies between April and October to determine presence/absence. Surveys will be conducted when *Atriplex* crown coverage is approximately 10 ft by 10 ft. A minimum of three surveys will be conducted.

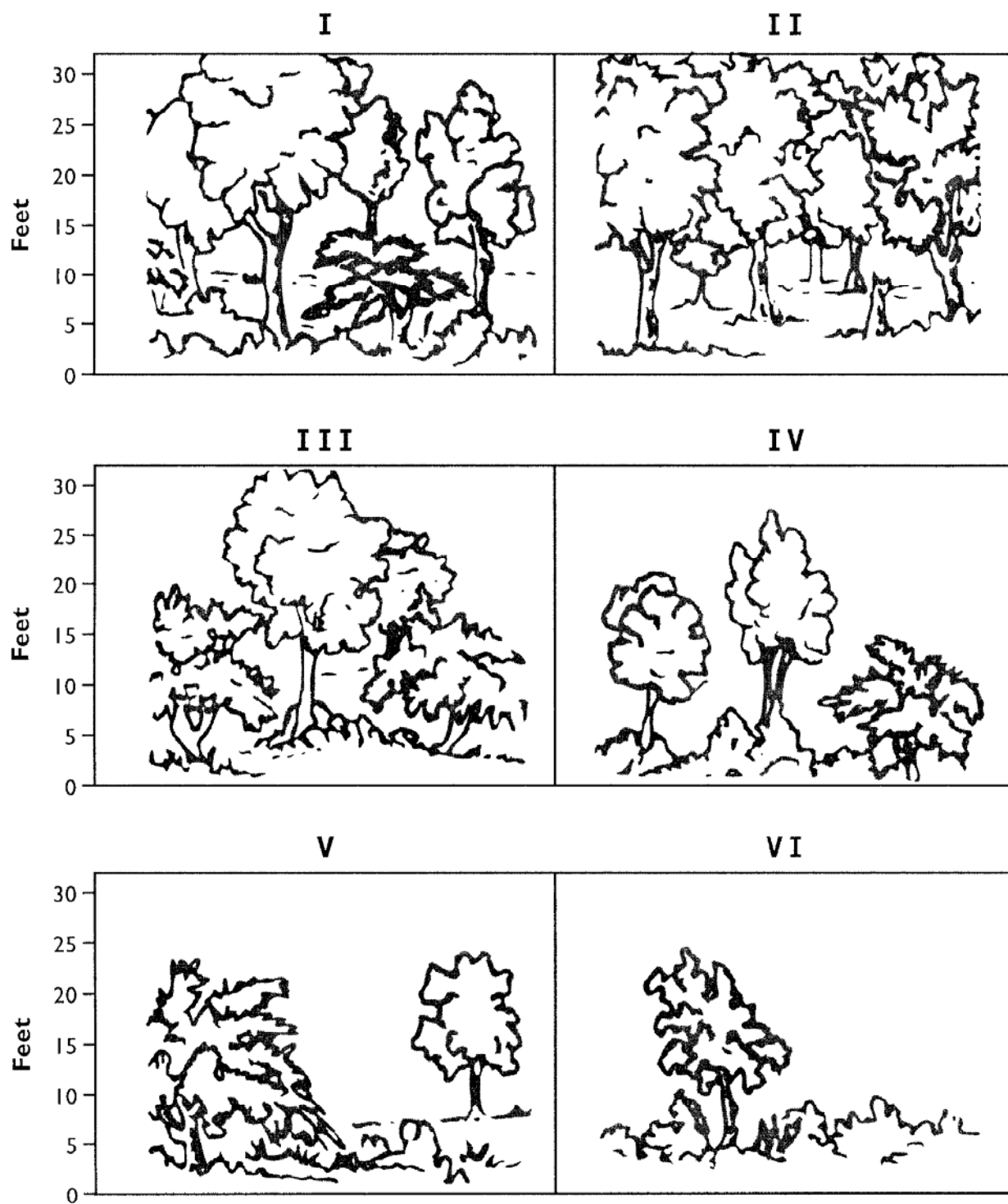
## Vegetation Classification

The HCP (LCR MSCP 2004) outlines the specific habitat acreage to be created and classified utilizing the Anderson and Ohmart (1976, 1984) classification system (Table 4 and Figure 5). Using aerial imagery of the site obtained annually, each phase of the project will be mapped, classified, and ground truthed.

**Table 4. Vegetation Communities, Criteria, and Types**

Community Type	Criteria	Vegetation Type
Cottonwood-willow (CW)	<i>P. fremontii</i> and <i>S. gooddingii</i> constituting at least 10% of total trees	I, II, III, IV, V, VI
Saltcedar (SC)	<i>Tamarix</i> spp. constituting 80-100% of total trees	I, II, III, IV, V, VI
Saltcedar-Honey mesquite (SH)	<i>P. glandulosa</i> constituting at least 10% of total trees	I, II, III, IV, V, VI
Saltcedar-Screwbean mesquite (SM)	<i>P. pubescens</i> constituting at least 20% of total trees	I, II, III, IV, V, VI
Honey mesquite (HM)	<i>P. glandulosa</i> constituting at least 90% of total trees	I, II, III, IV, V, VI
Arrowweed (AW)	<i>Tessaria sericea</i> constituting at least 90-100% of total vegetation area	I, II, III, IV, V, VI
<i>Atriplex</i> spp. (ATX)	<i>A. lentiformis</i> , <i>A. canescens</i> , or <i>A. polycarpa</i> constituting 90-100% of total vegetation in area	I, II, III, IV, V, VI

**Figure 5. Vegetation Classification**



Adapted from Anderson and Ohmart (1984).

## Monitoring Analysis and Evaluation

Once the data collected during implementation, effectiveness, and vegetation classification are analyzed, the results will be evaluated based on thresholds and trigger points identified by the reference conditions.

### Reference Conditions

The CVCA reference conditions will be modeled on conditions found during the SWFL long-term life history site studies along the LCR (McLeod et al. 2005, Koronkiewicz et al. 2005). These variables (Table 4) may change depending on future analysis of the long-term life history studies currently being conducted. Variables that will be referenced include canopy height, canopy closure, vertical foliage density, mean soil moisture (percent volume), mean diurnal temperature, mean maximum diurnal temperature, and mean diurnal relative humidity. These variables were chosen as there were statistically significant differences in use sites versus non-use sites at the SWFL life history study sites (McLeod et al. 2005, Koronkiewicz et al. 2005).

**Table 5. Reference Variables**

Canopy Height (M)	Average greater than 4.0 m
Canopy Closure (percent total)	Greater than 70%
Vertical Foliage Density	Density greatest between 1 and 4 m above ground; this may change as additional analysis is completed
Mean Soil Moisture (percent volume)	Minimum of 17% Average of 23%
Mean Diurnal Temperature (Celsius)	Between 26° C and 33° C
Mean Maximum Diurnal Temperature (Celsius)	Maximum of 45° C Average between 32° C and 45° C
Mean Diurnal Relative Humidity (percent)	Greater than 33% Average between 33% and 63%

### Thresholds

Thresholds signal that conditions are appropriate and to continue current management practices. The thresholds are as follows:

- Microclimate and vegetation reference conditions are achieved
- One or more covered species are utilizing CVCA during non-breeding season
- One or more covered species are utilizing CVCA during breeding season

- SWFL and/or YBCU are utilizing CVCA during non-breeding season
- SWFL and/or YBCU are utilizing CVCA during breeding season

In addition, if any monitoring activities documented that SWFL or YBCU were occupying the site before reference conditions were achieved, management and maintenance activities would be adjusted, as appropriate.

## **Trigger Points**

Trigger points signal the need to alter current management activities to achieve CVCA goals for the restoration site or change the goals for CVCA. The trigger points are:

- Microclimate and vegetation reference conditions have not been achieved
- Previously suitable land cover type structures are no longer suitable for any of the targeted covered species
- Targeted covered species habitat needs exceeded water availability

## **Adaptive Management**

Data will be evaluated annually to determine if the thresholds and/or trigger points were reached. If results indicate that the restoration activities meet or exceed thresholds, recommendations will be made in the annual report for future management activities at CVCA as well as other restoration activities. If results indicate that restoration activities were deleterious to covered species or habitats, recommendations on prescriptions and modifications will be identified, and other methods tested.

Plant community and structural type are a component necessary for obtaining performance criteria for woody riparian cover types. Criteria used to define woody riparian land cover types are determined by the Anderson and Ohmart Vegetation Classification System (1984). Annual reports will summarize the performance criteria of newly created habitat acreage and the specific habitat type acreage that will be credited as restored habitat. Through the adaptive management process, any structural management determined from vegetation classification will be defined in the annual report.

# **5.0 Reports**

## **Annual Report**

An annual report will be prepared by Reclamation and made available each calendar year summarizing the following:

- General description of the Project status and the effects on the covered species
- A table from the Mitigation Monitoring and Reporting Program (MMRP) indicating current implementation status of each mitigation measure

- A description of all restoration activities and monitoring actions conducted over the past year
- A summary of monitoring and research activities over the past year
- Results and analyses of monitoring and research data.
- An assessment of the effectiveness of each mitigation measures in minimizing and compensating for Project impacts
- The total number of acres planted
- The total number of acreage that meets or exceeds the performance standards
- Any other applicable information

Through the adaptive management process, each June a Restoration Plan for each Phase will be prepared. This plan will incorporate the monitoring results from the previous year. The plan will include the planting design, planting techniques grading plan, and demonstration or research plan for the acreage that will be converted. The monitoring results will indicate the amount of structural management that will be accomplished in the next year and any modifications to previously restored habitats.

## **Final Report**

A final report will be prepared by Reclamation and submitted no later than 180 days after the completion of all mitigation measures. The final report is anticipated in 2055 and will include the following information:

- A copy of the table in the MMRP with notes showing when each mitigation measure was implemented
- Recommendations on how mitigation measures might be changed to more effectively minimize and mitigate the impacts of future projects on the species
- Any other pertinent information

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